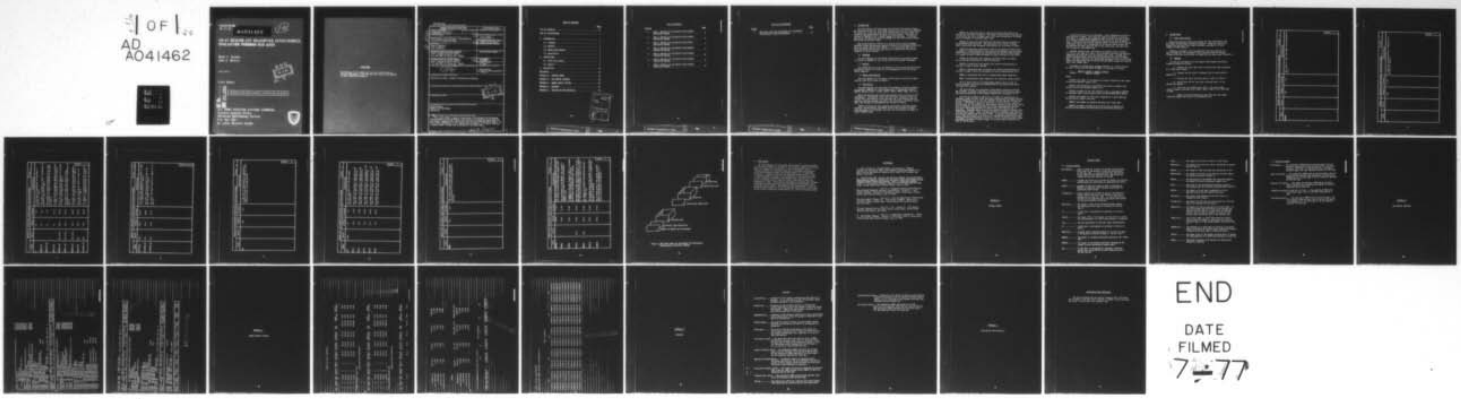
AD-A041 462 ARMY AVIATION SYSTEMS COMMAND ST LOUIS MO SYSTEMS AN--ETC F/G 1/3
CH-47 MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM R--ETC(U)
JUN 77 M E BARKLEY, J A WEAVER

UNCLASSIFIED DRSAV-D-77-10/2 USAAVSCOM-TR-77-31 NL

1 OF 1
AD A041462



END

DATE FILMED
7-77

USAAVSCOM
TR 77-31

12 B.S.

CH-47 MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM RUN BOOK

Mark E. Barkley
John A. Weaver

June 1977

Final Report

U.S. ARMY AVIATION SYSTEMS COMMAND
Systems Analysis Office
Advanced Methodology Division
P.O. Box 209
St. Louis, Missouri 63166

DISCLAIMER

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: USAAVSCOM TR 77-31
2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle): CH-47 Medium Lift Helicopter Effectiveness Evaluation Program Run Book.

5. TYPE OF REPORT & PERIOD COVERED: Final Report

6. PERFORMING ORG. REPORT NUMBER: DRSAV-D-77-10/2

7. AUTHOR(s): Mark E. Barkley, John A. Weaver

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS: US Army Aviation Systems Command, ATTN: Systems Analysis Office, P.O. Box 209, St. Louis, MO 63166

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS: US Army Aviation Systems Command, ATTN: Systems Analysis Office, P.O. Box 209, St. Louis, MO 63166

12. REPORT DATE: June 1977

13. NUMBER OF PAGES: 37 pages

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): 36p.

15. SECURITY CLASS. (of this report): Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Effectiveness
Medium Lift Helicopter
Evaluation

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report offers a general description of the Medium Lift Helicopter Effectiveness Evaluation Program, instructions for preparing input data and job control language (JCL) card decks, and for consolidating these decks. It also offers definitions of the input/output variables, a listing of the JCL, a sample output listing, and a glossary of the terms used.

408 245

1B

DD FORM 1473 EDITION OF 1 NOV 65 IS OBSOLETE UNCLASSIFIED

TABLE OF CONTENTS

	Page
LIST OF EXHIBITS	iv
LIST OF ILLUSTRATIONS	v
1. INTRODUCTION	1
1.1 Language	1
1.2 Machine	1
1.3 Memory Requirements	1
1.4 Description	1
2. INSTRUCTIONS	4
2.1 Input Card Formats	4
2.2 General	4
3. APPLICATION	14
REFERENCES	15
APPENDIX A. VARIABLE NAMES	16
APPENDIX B. JOB CONTROL LANGUAGE	20
APPENDIX C. SAMPLE OUTPUT LISTING	23
APPENDIX D. GLOSSARY	27
APPENDIX E. LOCATION OF USER MATERIALS	30

LIST OF EXHIBITS

Exhibit		Page
1	CARD 1, MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM	5
2	CARD 2, MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM	6
3	CARD 3, MEDIUM LIFT HELICOPTER EFFECTIVENSS EVALUATION PROGRAM	7
4	CARD 4, MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM	9
5	CARD 5, MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM	10
6	CARD 6, MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM	11
7	CARD 7, MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM	12

LIST OF ILLUSTRATIONS

Figure		Page
1	DATA DECK SETUP FOR THE MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM	13

1. INTRODUCTION

The CH-47 Medium Lift Helicopter Effectiveness Evaluation Program was developed by the U.S. Army TRADOC Systems Analysis Activity (TRASANA) in support of a cost and operational effectiveness analysis (COEA) for assessing the effectiveness of CH-47 aircraft systems. The model was written in FORTRAN IV for a UNIVAC System 1108 computer. Following completion, the model was used by TRASANA for the cited purpose during the tenure of the CH-47 COEA.

The Systems Analysis Office, U.S. Army Aviation Systems Command (AVSCOM), sought and obtained the CH-47 Medium Lift Helicopter Effectiveness Evaluation Program from TRASANA. It is now operational and is being evaluated for possible application in determining the optimum schedule for CH-47 aircraft.

1.1 Language

The CH-47 Medium Lift Helicopter Effectiveness Evaluation Program is written in FORTRAN IV, one of the high level computer languages.

1.2 Machine

The AVSCOM version of the CH-47 Medium Lift Helicopter Effectiveness Evaluation Program is written for and implemented on the IBM System 360/65 computer.

1.3 Memory Requirements

The CH-47 Medium Lift Helicopter Effectiveness Evaluation Program requires 120K 32-bit words of memory.

1.4 Description

The CH-47 Medium Lift Helicopter Effectiveness Evaluation Program is presently composed of a main program and 10 subprograms (AVGEFF, BMPPAR, DAYSEQ, FLEETF, FLTHRS, PRINT1, UNITF, RANDU, RANF, and FILL).

MAIN--The program that directs and controls the activities of the subprograms. For example, calls the statistical routine to add the current day's performance to the previous day's performance data and computes a moving average; and checks the 95 percent confidence limits, mean, and variance of performance for aircraft of type k.

AVGEFF--A subroutine that computes performance statistics (mean, variance, and 95 percent confidence limits) for aircraft of type k from the start of the computer run until its termination in number of sample (NOSMPL) days.

BMPPAR--A subroutine that is used to facilitate the sensitivity analysis of the input variables. The input variable under investigation is initially set at an assigned lower limit and incrementally increased until it reaches its assigned upper limit.

DAYSEQ--A subroutine that generates the daily mission sequence to be performed by an aircraft. The occurrence of a mission is based upon a pre-established frequency distribution for a mission of type m.

FLEETF--A subroutine that calls in the six alternative fleet mixes or number of units expected for each year of the analysis and calculates fleet relative effectiveness by multiplying the relative effectiveness of a type k aircraft times the number of type k aircraft in the fleet.

FLTHRS--A subroutine that computes the flight hours available for an aircraft to perform its daily mission(s).

PRINT1--A subroutine that outputs the relative effectiveness of aircraft of type k versus the MOE.

UNITF--A subroutine that calculates the relative effectiveness of aircraft of type k which are assigned to a given organizational unit.

RANDU--A subroutine that calls a pseudorandom number generator.

RANF--A pseudorandom number generator for producing random numbers.

FILL--A table look-up of pseudorandom numbers which is used to verify computer runs which are accomplished at the organization which developed this program.

The CH-47 Medium Lift Helicopter Effectiveness Evaluation Program was designed to handle a maximum of five distinct CH-47 aircraft types which may be exercised in any theater (Middle East, European, etc.).

Aircraft are assumed to operate out of table of organization and equipment (TO&E) aircraft units with each possessing an assigned strength and an homogeneous mix of aircraft (CH-47A, CH-47B, CH-47C, CH-47D, and CH-53E). The general concept of operation is the following: Mission profile data for the Middle East and European scenarios are defined. Daily mission requests are exacted upon the various organizational aircraft unit until each organizational aircraft unit's preallotted time is exhausted. Candidate CH-47 aircraft are ranked in order of average daily effectiveness values. Over a 20 year period, 6 alternate fleet mixes of aircraft are phased into the CH-47 fleet. A relative effectiveness value for a fleet of aircraft of a given mix is determined by multiplying the average relative effectiveness value for a CH-47 aircraft of type k times the number of CH-47 aircraft of type k in a given year's fleet mix for each of the 20 years.

A sensitivity analysis is performed. Each independent variable is examined over a range. Each time the target variable is increased, the number of flight hours allowed and MOE for CH-47 aircraft of type k to perform mission(s) of type m are calculated for each of NOSMPL days. Statistical performance measures (mean, variance, and 95 percent confidence limits) as a consequence of the mission profile data are accumulated and saved for each day of the simulation, from the first day through the last NOSMPL day.

The MOE, productivity, efficiency, utilization ratio, mission fill ratio, and load fill ratio, are calculated from daily performance summations and combined with the previous day's MOE. The MOE and relative effectiveness values are calculated and verified for NOSMPL days. The mean, variance, and 95 percent confidence limits are printed along with the average daily relative effectiveness values for aircraft type k over NOSMPL days.

The number of flight hours allowed (FHALOW) for a CH-47 aircraft of type k to perform a mission of type m is computed as follows:

$$\text{FHALOW} = \frac{\text{MNTPER X PERAVL X EFFNCY X SHFTLN}}{\text{MMHPFH X COMFAC}},$$

where

MNTPER--The number of maintenance personnel assigned to the target aircraft maintenance support unit.

PERAVL--The percentage of the MNTPER who actually supports the target aircraft maintenance support unit.

EFFCNY--A number on the unit interval that is assigned to MNTPER to represent their relative proficiency for performing their duties.

SHFTLN--The number of clock hours expended by a given employee during her/his regular work day.

MMHPFH--The number of standard man-hours per flight hour.

COMFAC--A number assigned to an aircraft unit to denote its relative effectiveness for performing its dedicated mission(s).

2. INSTRUCTIONS

2.1 Input Card Formats

Below are complete input card layouts for the CH-47 Medium Lift Helicopter Effectiveness Evaluation Program. (Note that each card layout also describes the target variables, parameters, or data elements listed thereon.)

Exhibits 1 through 7 show the specific input card layouts for the CH-47 Medium Lift Helicopter Effectiveness Evaluation Program. (Please follow the instructions for preparing the input cards literally.)

2.2 General

To exercise the Medium Lift Helicopter Effectiveness Evaluation Program, proceed as follows:

a. Prepare the input data cards as prescribed under paragraph 2.1, Input Card Formats.

b. Prepare the job control language (JCL) as prescribed in Appendix B.

c. Arrange the input card data deck as shown in Figure 1.

d. Consolidate the JCL and input card data decks in the appropriate manner.

e. Place the consolidated card deck in the card reader (read-in hopper) and press STOP, ABORT, RESET, END OF FILE, AND START to read.

f. Remove the consolidated card deck from the card reader (read-out hopper) and store in a designated place.

MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM				CARD: 1
PARA	UNITS	FORMAT	COLUMNS	DESCRIPTION
NOSMPL		I10	1-10	The number of days the model was designated to run.

CARD: 1

MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM				CARD: 2
PARA	UNITS	FORMAT	COLUMNS	DESCRIPTION
K		I10	1-10	A code that is designated to represent an aircraft of type k.

CARD: 2

MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM				CARD: 3
PARA	UNITS	FORMAT	COLUMNS	DESCRIPTION
M		I5	1-5	A code that is designated to represent a mission of type m.
NOAC(K,M)		I3	6-8	The number of aircraft of type k designated to pursue a mission of type m.
NOSRTY(K,M)		I3	9-11	The number of sorties designated to be flown by aircraft of type k in pursuit of missions of type m.
MACC(K,M)		I3	12-14	A number which designates whether an aircraft of type k can perform a mission of type m.
TMREQ(K,M)	Ton miles	F9.0	15-23	Short ton nautical miles required of aircraft of type k on missions of type m.
TMDEL(K,M)	Ton miles	F9.0	24-33	The number of short ton nautical miles delivered by aircraft of type k on missions of type m.
TMCAP(K,M)	Ton miles	F9.0	34-42	The short ton nautical miles deliverable by aircraft of type k on missions of type m.
FUEL(K,M)	Gal.	F9.0	43-51	Total fuel used by aircraft of type k on missions of type m.
TALLOW(K,M)	Hrs.	F5.0	52-56	The amount of time prealloted for aircraft of type k to complete missions of type m.

CARD: 3

MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM				CARD: 3 Cont
PARA	UNITS	FORMAT	COLUMNS	DESCRIPTION
TACT(K,M)	Hrs.	F5.0	57-61	The actual time expended by aircraft of type k to complete missions of type m.
BLKTIM(K,M)	Hrs.	F5.0	62-66	The total time the aircraft of type k are used to complete their mission.
FLTTIM(K,M)	Hrs.	F5.0	67-71	The total time each aircraft of type k is in the air.

CARD:3 Cont'd

MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM				CARD: 4
PARA	UNITS	FORMAT	COLUMNS	DESCRIPTION
NA		I10	1-10	A code that is designated to represent a specific option for a given CH-47 aircraft fleet mix over a 20 year period.

CARD: 4

MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM				CARD: 5
PARA	UNITS	FORMAT	COLUMNS	DESCRIPTION
LYR	Years	I5	1-5	The last two digits of the year under consideration.
NC(1)		I10	6-15	The number of aircraft of type one in the fleet for the year under consideration.
NC(2)		I10	16-25	The number of aircraft of type two in the fleet for the year under consideration.
NC(3)		I10	26-35	The number of aircraft of type three in the fleet for the year under consideration.
NC(4)		I10	36-45	The number of aircraft of type four in the fleet for the year under consideration.
NC(5)		I10	46-55	The number of aircraft of type five in the fleet for the year under consideration.
				CARD: 5

MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM				CARD: 6
PARA	UNITS	FORMAT	COLUMNS	DESCRIPTION
VRABL		I10	1-10	The initial value of the target variable to be varied if a sensitivity analysis is desired.

CARD: 6

MEDIUM LIFT HELICOPTER EFFECTIVENESS EVALUATION PROGRAM				CARD: 7
PARA	UNITS	FORMAT	COLUMNS	DESCRIPTION
MNTPER		F10.0	1-10	The number of maintenance personnel assigned to the target aircraft maintenance support unit.
PERAVL		F10.0	11-20	The percentage of the MNTPER who actually supports the target aircraft maintenance support unit.
EFFNCY		F10.0	21-30	A number on the unit interval that is assigned to MNTPER to represent their relative proficiency for performing their duties.
SHFTLN	Hrs.	F10.0	31-40	The number of clock hours expended by a given employee during his regular work day in support of the aircraft maintenance support activity.
MMHPFH	Hrs.	F10.0	41-50	The number of standard maintenance man-hours per flight hour.
UPRLIM		F10.0	51-60	The maximum value of the target variable which is chosen for consideration if a sensitivity analysis is desired.
LWRLIM		F10.0	61-70	The minimum value of the target variable which is chosen for consideration if a sensitivity analysis is desired. CARD: 7

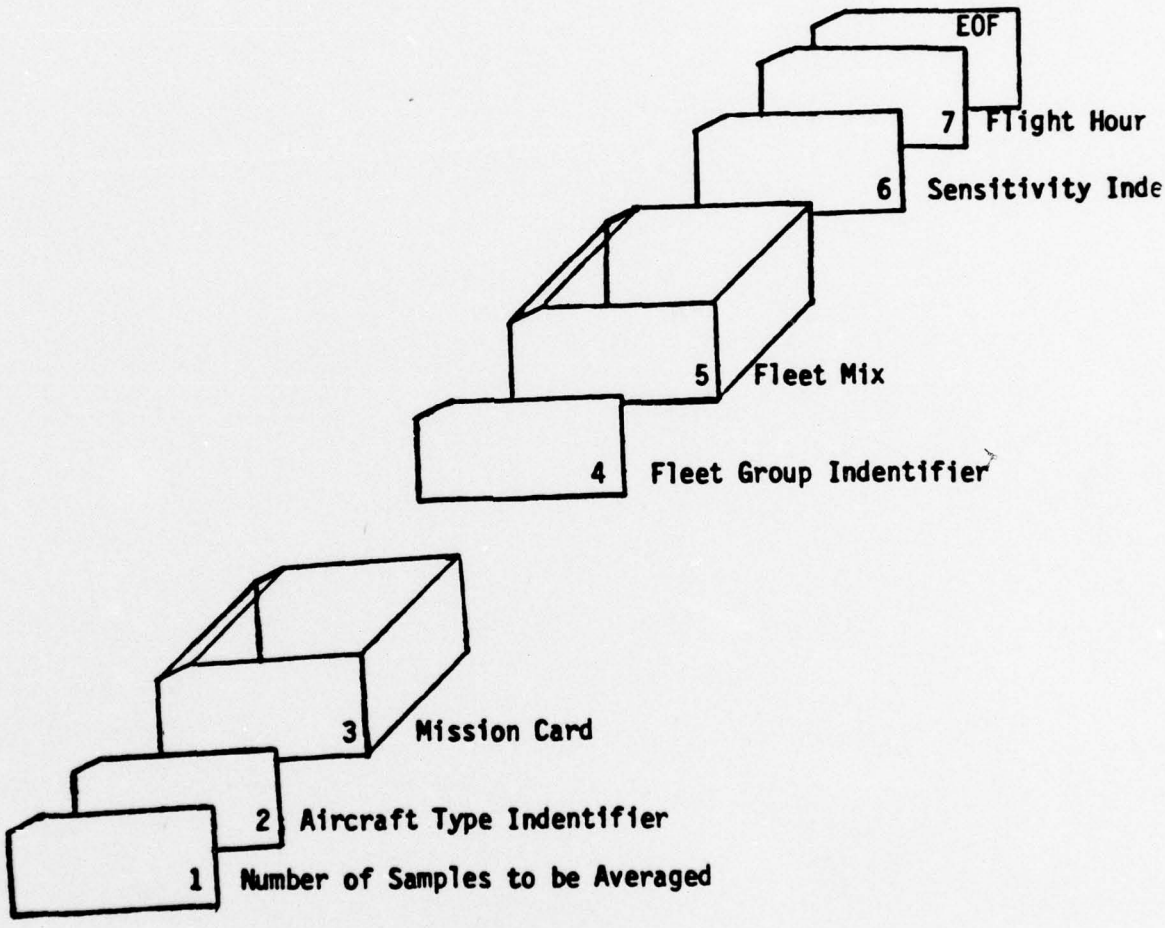


Figure 1. Data Deck Setup for the Medium Lift Helicopter Effectiveness Evaluation Program

3. APPLICATION

The CH-47 Medium Lift Helicopter Effectiveness Evaluation Program may be used to obtain an estimate of the relative composite effectiveness of a medium lift or possibly a utility helicopter system (implying possibly a different value for a different configuration or series helicopter system) in the performance of its dedicated mission(s). Note that the relative composite effectiveness of one of these helicopter systems is extracted from a concept called MOE, in this instance, principally and specifically, the mission fill ratio, utilization ratio, load fill ratio, efficiency index, and productivity index. These MOE are purported to be among the foremost indicators for measuring the relative composite effectiveness of a CH-47 helicopter system. Additionally, this program may be used to determine the sensitivity of the various MOE (which were cited above) on the relative composite effectiveness of a CH-47 helicopter system.

REFERENCES

1. Diaz, Alfonso A., Armando Flores, and Lawrence J. McManus. "Medium Lift Helicopter (MLH) Effectiveness Evaluation Program." U.S. Army Training and Doctrine Command, White Sands Missile Range, New Mexico, June 1975.

2. United States Army Training and Doctrine Command, and United States Army Materiel Command. Medium Lift Helicopter (MLH) CH-47 Modernization Program Concept Formulation Package. Part I -- Executive Summary. Volume I. Fort Rucker, Alabama: Medium Lift Helicopter Special Study Group, United States Army Aviation Center, July 14, 1975.

3. _____... Part II -- Trade-off Determination/Trade-off Analysis/Best Technical Approach (TOD/TOA/BTA). Volume II. Fort Rucker, Alabama: Medium Lift Helicopter Special Study Group, United States Army Aviation Center, July 14, 1975.

4. _____... Part III -- Cost and Operational Effectiveness Analysis (COEA). Volume III. Fort Rucker, Alabama: Medium Lift Helicopter Special Study Group, United States Army Aviation Center, July 14, 1975.

5. _____... Part IV -- (S). Volume IV. Fort Rucker, Alabama: Medium Lift Helicopter Special Study Group, United States Army Aviation Center, July 1975.

6. _____... Part III -- Appendices O through CC. Volume V. Fort Rucker, Alabama: Medium Lift Helicopter Special Study Group, United States Army Aviation Center, July 14, 1975.

APPENDIX A

VARIABLE NAMES

VARIABLE NAMES

1.1 Input Variables

BLKTIM(K,M)..... Given k-number of aircraft to satisfy the objective, block time is the elapse in time from engine start of the 1st, 2nd, ..., kth aircraft from the base of origin (BOO) to the objective until the return and landing of the last aircraft to the BOO.

COMFAC..... A number assigned to an aircraft to denote its relative effectiveness for performing its dedicated mission(s).

EFFNCY..... A number on the unit interval that is assigned to MNTPER to represent their relative proficiency for performing their duties.

FLTIM(K,M)..... Given k-number of aircraft to satisfy the objective, flight time is the sum of the lapses in time from engine start of the 1st, 2nd, ..., kth aircraft from the BOO to the objective until the return and landing of the last aircraft to the BOO.

FUEL(K,M)..... The amount of fuel to be consumed between takeoff and landing aircraft type k in pursuit of mission type m.

K..... A code that is designated to represent an aircraft type k.

LWRLIM..... The lower limit of the target variable which is chosen for consideration if a sensitivity analysis is desired.

LYR..... The last two digits of the year under consideration.

M..... A code that is designated to represent a mission of type m.

MACC(K,M)..... A number which indicates whether an aircraft of type k can perform a mission of type m. (0-no; 1-yes)

MMHPFH..... The number of standard maintenance man-hours per flight hour.

MNTPER..... The number of maintenance personnel assigned to the target aircraft maintenance support unit.

NA..... A code that is designated to represent a specific option for a given CH-47 aircraft fleet mix over a 20 year period.

NC(K)..... The number of aircraft of type k in the fleet.

NOAC(K,M)..... The number of aircraft of type k designated to pursue mission type m.

NOSMPL..... The number of days the model was designated to run.

NOSRTY(K,M)..... The number of sorties to be flown by aircraft type k to complete missions of type m.

PERAVL..... The percentage of the MNTPER who actually supports the target aircraft maintenance support unit.

RL(L)..... The value of the distribution function at point L. (The method used for picking the appropriate mission.)

SHFTLN..... The number of clock hours expended by a given employee during her/his regular work day.

TACT(K,M)..... The actual time expended by aircraft type k to complete mission type m.

TALLOW(K,M)..... The amount of time that was pre-alloted for aircraft type k to complete mission type m.

TMCAP(K,M)..... The number of sorties possible by aircraft type k in the pre-alloted time multiplied by the maximum payload of aircraft type k in short tons to complete mission type m times the number of nautical miles one-way from the pickup zone to the landing zone.

TMDEL(K,M)..... The actual number of short tons moved by aircraft type k times the number of nautical miles flown by aircraft type k in the accomplishment of mission type m.

TMREQ(K,M)..... The movement of a given mass of material by aircraft type k in pursuit of mission type m times the distance traveled by aircraft type k in nautical miles.

UPRLIM..... The upper limit of the target variable which is chosen for consideration if a sensitivity analysis is desired.

VRABL..... The target variable to be varied if a sensitivity analysis is desired.

1.2 Output Variables

Efficiency..... The cumulative TMDEL(K,M) by aircraft type k for all missions flown during a day divided by the cumulative pounds of FUEL(K,M), in 100-pound units, consumed by aircraft type k for the required missions for that day.

Load Fill Ratio.... The cumulative TMDEL(K,M) by aircraft type k for all missions flown during a day divided by the cumulative TMREQ(K,M) of aircraft type k for all missions required during that day.

Mission Fill Ratio.... The number of missions completed by aircraft type k during a day divided by the number of missions requested during that day.

Productivity Rate for One Unit of Time.... The cumulative TMDEL(K,M) by aircraft type k for all missions flown during a day.

Utilization Ratio.... The cumulative TMDEL(K,M) by aircraft type k for all missions flown during a day divided by the cumulative TMCAP(K,M) of aircraft type k for the required missions for that day.

APPENDIX B

JOB CONTROL LANGUAGE

```
//FP4SAVE JOB (2T04,F03n,,5),'TSOFORT',NOTIFY=FWEAVER,CLASS=A                JOB 2536
/*ROUTE PRINT REMOTE1                                                       00000020
//        EXEC FORTGCLA,                                                    00000030
/*          PARM.FORT='LIST',                                               00000040
//   PARM.LKED='MAP,TEST,LET,XREF,LIST',                                    00000050
//        REGION.GO=200K                                                    00000060
XXDEFAULTS PROC SYSOUT=A                                                    00000100
XXFORT    EXEC PGM=IEYFORT,REGION=100K,DPRTY=(3,3)                          00000200
XXSYSPRINT DD  SYSOUT=*.SYSOUT                                              00000300
IEF653I SUBSTITUTION JCL - SYSOUT=A
XXSYSLIN  DD  DSN=&&OBJECT,UNIT=ITFL,SPACE=(CYL,(1,1)),                     00000400
XX            DCB=BLKSIZE=800,DISP=(,PASS)                                  00000500
//FORT.SYSIN  DD    DSN=FWEAVER.MCMANUS.FORT,DISP=SHR                       00000070
IEF236I ALLOC. FOR FP4SAVE  FORT
IEF237I 001   ALLOCATED TO SYSPRINT
IEF237I 114   ALLOCATED TO SYSLIN
IEF237I 136   ALLOCATED TO SYSIN
IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS77151.T090AEA.RV000.FP4SAVE.OBJECT          PASSED
IEF285I   VOL SER NOS= TESEOS.
IEF285I   FWEAVER.MCMANUS.FORT                           KEPT
IEF285I   VOL SER NOS= DESEO2.
IEF373I STEP /FORT    / START 77151.1231
IEF374I STEP /FORT    / STOP  77151.1233 CPU    0MIN 32.79SEC MAIN 106K CC=   0

*STEP FORT    **JOB FP4SAVE ***************************************************
*RESOURCE- CORE(K)  DISK(IO)  TAPE(IO)--UNITS(II)    IN-HASP(IO)-OUT OTHER(IO)   CPU TIME(C) STEP TIME(T)  *
*USAGE-       106         7A          0          0          0       1072          0   00:00:32.79  00:01:30.43  *
*****************************************************************************

21
XXLKED    EXEC PGM=IEWLFA00,PARM='LIST,LET,XREF',REGION=100K,             00000600
XX            COND=(4,LT,FORT),DPRTY=(3,3)                                  00000700
XXSYSPRINT DD  SYSOUT=&SYSOUT                                               00000800
IEF653I SUBSTITUTION JCL - SYSOUT=A
//LKED.SYSLIB  DD  DSN=SYS1.FORTLIB,DISP=SHR                                00000080
X/SYSLIB  DD  DSN=NONO.FORTLIB,DISP=SHR                                     00000900
//            DD  DSN=FWEAVER.LIBRARY.LOAD,DISP=SHR                         00000090
XXSYSLIN  DD  DSN=&&OBJECT,DISP=(OLD,DELETE)                                00001000
XX            DD  DDNAME=SYSIN                                              00001100
XXSYSUT1  DD  UNIT=ITFL,SPACE=(CYL,(1,1))                                   00001200
XXSYSLMOD DD  DSN=&&LOAD(MAIN),UNIT=ITFL,SPACE=(CYL,(1,3,1)),               00001300
XX            DISP=(,PASS)                                                  00001400
IEF236I ALLOC. FOR FP4SAVE  LKED
IEF237I 0C0   ALLOCATED TO SYSPRINT
IEF237I 115   ALLOCATED TO SYSLIN
IEF237I 136   ALLOCATED TO
IEF237I 114   ALLOCATED TO SYSIN
IEF237I 114   ALLOCATED TO SYSUT1
IEF237I 114   ALLOCATED TO SYSLMOD
IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS1.FORTLIB                                   KEPT
IEF285I   VOL SER NOS= TESFPP.
IEF285I   FWEAVER.LIBRARY.LOAD                           KEPT
IEF285I   VOL SER NOS= DESEO2.
IEF285I   SYS77151.T090AEA.RV000.FP4SAVE.OBJECT          DELETED
IEF285I   VOL SER NOS= TESEOS.
IEF285I   SYS77151.T090AEA.RV000.FP4SAVE.P0001227        DELETED
IEF285I   VOL SER NOS= TESEOS.
IEF285I   SYS77151.T090AEA.RV000.FP4SAVE.LOAD            PASSED
IEF285I   VOL SER NOS= TESEOS.
```

```
IEF373I STEP /LKED    / START 77151.1231
IEF374I STEP /LKED    / STOP  77151.1235 CPU   0MIN 02.22SEC MAIN  96K CC=   0

-STEP LKED     -JOB FP4SAVE ----------------------------------------------------------------------
-RESOURCE- CORE(K)  DISK(IO)  TAPE(IO)--UNITS(H)      IN-HASP(IO)-OUT OTHER(IO)   CPU TIME(C) STEP TIME(T)  -
-USAGE-        100        377          0          0          0        182          0  00:00:02.22  00:02:22.61  -
----------------------------------------------------------------------------------------------------

//GO     EXEC PGM=*.LKED.SYSLMOD,COND=((4,LT,FORT),(4,LT,LKED)),      00001500
//            PRTY=(3,7)                                            00001600
//FT05F001 DD  DDNAME=SYSIN                                         00001700
//FT06F001 DD  SYSOUT=&SYSOUT                                       00001800
IEF653I SUBSTITUTION JCL - SYSOUT=A
//FT07F001 DD  SYSOUT=*                                             00001900
//GO.SYSIN DD DSN=FWEAVER.MCHANIC.DATA,                             00000100
//         DISP=OLD                                                 00000110
//
IEF236I ALLOC. FOR FP4SAVF  GO
IEF237I 114  ALLOCATED TO PGM=*.DD
IEF237I 133  ALLOCATED TO FT05F001
IEF237I 0C0  ALLOCATED TO FT06F001
IEF237I 1A2  ALLOCATED TO FT07F001
IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS77151.T090A6A.RV000.FP4SAVF.LOAD           PASSED
IEF285I   VOL SER NOS= IFSE05.
IEF285I   FWEAVER.MCHANIC.DATA                          KEPT
IEF285I   VOL SER NOS= IFSE06.
IEF373I STEP /GO      / START 77151.1235
IEF374I STEP /GO      / STOP  77151.1236 CPU   0MIN 06.79SEC MAIN  96K CC=   0

-STEP GO       -JOB FP4SAVE ----------------------------------------------------------------------
-RESOURCE- CORE(K)  DISK(IO)  TAPE(IO)--UNITS(H)      IN-HASP(IO)-OUT OTHER(IO)   CPU TIME(C) STEP TIME(T)  -
-USAGE-        200          4          0          0          0        991          0  00:00:06.79  00:00:20.37  -
----------------------------------------------------------------------------------------------------

IEF285I   SYS77151.T090A6A.RV000.FP4SAVF.LOAD           DELETED
IEF285I   VOL SER NOS= IFSE05.
IEF375I  JOB /FP4SAVE / START 77151.1231
IEF376I  JOB /FP4SAVE / STOP  77151.1236 CPU   0MIN 41.80SEC

-JOB FP4SAVE --2!04--F030--!SOFOW!----------------------------------------------------------------
-UNITS- CORE(KBT)   DISK(IO)   TAPE(IO)  TAPE(UNIT)  HASPI(IO)  HASPO(IO)  OTHER(IO)      CPU(C)       TOTAL  -
-COSTS-      $0.38      $0.14      $0.00       $0.00      $0.00      $0.00      $0.00      $2.55       $2.99  -
----------------------------------------------------------------------------------------------------
```

APPENDIX C

SAMPLE OUTPUT LISTING

CUMULATIVE DAILY PERFORMANCE

A/C TYPE	MISSION TYPE	TIME LEFT	MISSIONS ACCOMP.	SORTIES COMP.	TONMILES DELIVERED	TONMILES REQUESTED	TONMILES DELIVERABLE	FUEL USED	BLOCK TIME USED	FLIGHT TIME USED
1	2	-22.74	0	2	384.45	384.45	387.82	5301.70	2.93	2.66
2	2	-14.55	0	3	565.66	565.66	941.82	6422.05	2.18	2.65
3	2	-12.45	0	3	644.33	644.33	1125.78	7132.04	2.96	2.65
4	2	-12.35	0	3	649.22	649.22	1516.52	7054.33	2.91	2.65
5	2	-10.99	0	3	737.07	737.07	1772.54	8832.65	2.81	2.65

000000NEW DAY0DAILY SEQN CLEAR

CUMULATIVE DAILY PERFORMANCE

A/C TYPE	MISSION TYPE	TIME LEFT	MISSIONS ACCOMP.	SORTIES COMP.	TONMILES DELIVERED	TONMILES REQUESTED	TONMILES DELIVERABLE	FUEL USED	BLOCK TIME USED	FLIGHT TIME USED
1	2	-22.74	0	2	384.45	384.45	387.82	5301.70	2.93	2.66
2	2	-14.55	0	3	565.66	565.66	941.82	6422.05	2.18	2.65
3	2	-12.45	0	3	644.33	644.33	1125.78	7132.04	2.96	2.65
4	2	-12.35	0	3	649.22	649.22	1516.52	7054.33	2.91	2.65
5	2	-10.99	0	3	737.07	737.07	1772.54	8832.65	2.81	2.65

000000NEW DAY0DAILY SEQN CLEAR

CUMULATIVE DAILY PERFORMANCE

A/C TYPE	MISSION TYPE	TIME LEFT	MISSIONS ACCOMP.	SORTIES COMP.	TONMILES DELIVERED	TONMILES REQUESTED	TONMILES DELIVERABLE	FUEL USED	BLOCK TIME USED	FLIGHT TIME USED
1	1	-35.24	0	3	362.96	362.96	367.46	6013.71	2.89	2.66

PRODUCTIVITY	10191.512	1820.904	9034.176	11348.844
FUEL EFFICIENCY	13.435	2.151	12.074	14.795
UTILIZATION	0.809	0.199	0.684	0.935
LOAD FILL RATIO	1.000	0.000	1.000	1.000
MISSION FILL RATIO	0.583	0.112	0.512	0.654

CMS3-E

	AVERAGE	STD DEV	LOWER CONF LIMIT	UPPER CONF LIMIT
PRODUCTIVITY	4579.301	1121.090	3870.351	5288.430
FUEL EFFICIENCY	11.882	2.541	10.275	13.489
UTILIZATION	0.766	0.242	0.613	0.919
LOAD FILL RATIO	1.000	0.000	1.000	1.000
MISSION FILL RATIO	0.174	0.290	-0.009	0.357

25

RUN CONCLUDED FOR 100 DAYS AND 11 TH CYCLE

	TYPE OF AIRCRAFT (A)	(B)	(C)	(D)	(E)
SENSITIVITY PARAMETER NO. 1	0.273000E+02	0.276400E+02	0.282100E+02	0.540000E+02	0.208800E+02
FLIGHT HOURS AVAILABLE	0.105857E+02	0.105857E+02	0.105857E+02	0.265380E+02	0.105857E+02

oooooSENSITIVITY ANALYSIS000000

GRAPH OF FLIGHT HOURS AVAILABLE VS PARAMETER NO. 1

TYPE OF AIRCRAFT

(A)	(B)	(C)	(D)	(E)
0.2454E+01 ! 0.4864E+01	0.2444E+01 ! 0.4891E+01	0.2446E+01 ! 0.7070E+01	0.2649E+01 ! 0.5390E+01	0.2646E+01 ! 0.5220E+01
0.3469E+01 ! 0.4896E+01	0.3440E+01 ! 0.7483E+01	0.3438E+01 ! 0.9184E+01	0.5038E+01 ! 0.1025E+02	0.3440E+01 ! 0.4786E+01
0.4242E+01 ! 0.1094E+02	0.4234E+01 ! 0.9464E+01	0.4229E+01 ! 0.1130E+02	0.7427E+01 ! 0.1511E+02	0.4234E+01 ! 0.8352E+01
0.5036E+01 ! 0.1294E+02	0.5028E+01 ! 0.1127E+02	0.5020E+01 ! 0.1341E+02	0.9816E+01 ! 0.1997E+02	0.5028E+01 ! 0.9918E+01
0.5829E+01 ! 0.1503E+02	0.5822E+01 ! 0.1300E+02	0.5812E+01 ! 0.1553E+02	0.1220E+02 ! 0.2483E+02	0.5822E+01 ! 0.1148E+02
0.6621E+01 ! 0.1707E+02	0.6616E+01 ! 0.1477E+02	0.6603E+01 ! 0.1764E+02	0.1459E+02 ! 0.2969E+02	0.6616E+01 ! 0.1305E+02
0.7414E+01 ! 0.1912E+02	0.7410E+01 ! 0.1655E+02	0.7394E+01 ! 0.1975E+02	0.1698E+02 ! 0.3456E+02	0.7410E+01 ! 0.1462E+02
0.8207E+01 ! 0.2116E+02	0.8204E+01 ! 0.1832E+02	0.8186E+01 ! 0.2187E+02	0.1937E+02 ! 0.3942E+02	0.8204E+01 ! 0.1618E+02
0.9000E+01 ! 0.2321E+02	0.8998E+01 ! 0.2009E+02	0.8977E+01 ! 0.2398E+02	0.2176E+02 ! 0.4428E+02	0.8998E+01 ! 0.1775E+02
0.9793E+01 ! 0.2526E+02	0.9792E+01 ! 0.2187E+02	0.9768E+01 ! 0.2610E+02	0.2415E+02 ! 0.4914E+02	0.9792E+01 ! 0.1931E+02
0.1059E+02 ! 0.2730E+02	0.1058E+02 ! 0.2364E+02	0.1056E+02 ! 0.2821E+02	0.2654E+02 ! 0.5400E+02	0.1059E+02 ! 0.2088E+02

APPENDIX D

GLOSSARY

GLOSSARY

Availability..... A measure of the system's condition at the start of a mission. It is a function of the relationships among hardware, personnel, and procedures.

Capability..... A measure of the system's ability to achieve the mission objectives, given the system's condition during the mission. Capability specifically accounts for the performance spectrum of the system.

Dependability.... A measure of the system's condition at one or more points during the mission, given the system's condition at the start of the mission.

Effectiveness.... The extent to which a target aircraft weapon system performs the mission(s) for which it was designed or purported.

Efficiency..... The ratio of the work performed by the target aircraft weapon system during a specified time period to the energy, maintenance, etc. supplied to it during that time period.

Efficiency, CH-47... The cumulative short ton nautical miles (STNMs) delivered by aircraft type k for all missions flown during a day divided by the cumulative pounds of fuel (in 100-pounds units) consumed by aircraft type k for all missions flown during that day.

Load-Fill-Ratio, CH-47... The cumulative STNMs delivered by aircraft type k for all missions flown during a day divided by the cumulative STNMs required of aircraft type k for all missions required for that day.

Measure of Effectiveness... A prominent factor or component which discloses one facet of the effectiveness with which a target aircraft weapon system performs the mission(s) for which it was designed or purported.

Mission-Fill-Ratio, CH-47... The number of missions completed by aircraft type k during a day divided by the number of missions requested during that day.

Productivity, CH-47... The cumulative STNMs delivered by aircraft type k for all missions flown during a day.

Sortie..... The flying of a CH-47 on a one-way trip with payload from the pickup or loading zone to the target zone.

System Effectiveness... A measure of the extent to which a system may be expected to achieve a set of specific mission requirements. It is a function of the system's availability, dependability and capability.

Utilization Ratio... The cumulative STNMs delivered by aircraft type k for all missions flown during a day divided by the cumulative STNMs deliverable by aircraft type k for the required missions for that day.

APPENDIX E

LOCATION OF USER MATERIALS

LOCATION OF USER MATERIALS

The source program and job control language (JCL) card decks can be found in the card files, Cabinet 2, Drawer 4 (from the top), left side, in the sixth floor computer room.